

WHAT IS CLAIMED IS:

1. A process for controlled radical polymerization using an organosulfur reversible chain transfer agent which consists in preparing polymers having a molar weight of greater than 100 000 g/mol, with a polydispersity index of less than 1.2 for molar weights of less than 200 000 g/mol and of less than 1.4 for molar weights of greater than 200 000 g/mol, with a degree of conversion of monomer of greater than 75% and a polymerization time of less than 8 h, characterized by the control of the flux of initiator radicals in the polymerization medium.
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- 15 2. The polymerization process as claimed in claim 1, characterized in that the control of the flux of initiator radicals is achieved by the stages consisting in:
 - i) maintaining a uniform polymerization temperature T_1 during the initiation period, and
 - 20 ii) continuing the polymerization, the polymerization temperature being allowed to fall to the temperature T_2 ,
it being understood that T_1 and T_2 correspond to the
25 following equations (1) and (2):
$$T_1 > T_2 \quad (1) \text{ and}$$
$$T_1 - T_2 \leq 50^\circ\text{C} \quad (2).$$
- 30 3. The polymerization process as claimed in claim 2, characterized in that T_1 is between 60 and 95°C, more preferably between 80 and 90°C.
- 35 4. The polymerization process as claimed in either of claims 2 and 3, characterized in that T_2 is between 40 and 75°C, preferably between 50 and 70°C.
5. The polymerization process as claimed in claim 2, characterized in that T_1 is equal to 80°C and T_2 is equal to 60°C.

6. The polymerization process as claimed in any one of claims 2 to 5, characterized in that the monomers are monomers derived from acrylamide, in particular N-acryloylmorpholine.

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7. The polymerization process as claimed in any one of claims 2 to 6, characterized in that the chain transfer agent is tert-butyl dithiobenzoate.

10 8. The polymerization process as claimed in any one of claims 2 to 7, characterized in that the initiating agent is azobisisobutyronitrile.

15 9. The polymerization process as claimed in claim 1, characterized in that the control of the flux of initiator radicals is achieved by the use of an initiating agent having a decomposition rate constant which is greater than that of azobisisobutyronitrile at the uniform temperature under consideration.

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10. The polymerization process as claimed in claim 9, characterized in that the initiating agent is 2,2'-azobis(2,4-dimethylvaleronitrile).

25 11. The polymerization process as claimed in either of claims 9 and 10, characterized in that the polymerization is carried out at uniform temperature.

30 12. The polymerization process as claimed in any one of claims 9 to 11, characterized in that the monomers are monomers derived from acrylamide, preferably N-acryloylmorpholine.

35 13. The polymerization process as claimed in any one of claims 9 to 12, characterized in that the chain transfer agent is tert-butyl dithiobenzoate.

14. A polymer of acrylamide or of its derivatives having a number-average molar weight of greater than or

equal to 100 000 g/mol, characterized in that it has a polydispersity index of less than 1.2 when the molar weight is absolutely less than 200 000 g/mol and in that it has a polydispersity index of less than 1.4 5 when the molar weight is greater than 200 000 g/mol.

15. The polymer as claimed in claim 14, characterized in that it is an N-acryloylmorpholine homopolymer.